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The effect of foreign income on economic performance of a small-open economy: evidence from Turkey

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The effect of a shock in the foreign economic performance on the domestic economy is an attractive research area. It has consistently been found that this effect is non-negligible. However, the countries examined are mostly developed countries. In this study, the effects of a shock in foreign economy on the economic performance of Turkey are examined. The estimates suggest that a positive shock in the foreign economy positively affects Turkish output, increases the inflation rate, and appreciates the real exchange rate.

I. INTRODUCTION

As the world's economies become more interconnected, the analysis of the effects of foreign countries economic performance on a domestic economy has become more important. Thus, economists have begun to pay more attention to this topic over the last decades. Cross-country correlations among macroeconomic performances have been widely documented in papers such as Burdekin (1989), Lastrapes and Koray (1990), Joyce and Kamas (1994). In particular, studies such as Backus *et al.* (1992), Stockman and Tesar (1995) consistently find that cyclical variations in output as well as in other macroeconomic aggregates are positively correlated across countries.¹ A prominent paper on this topic, Schmitt-Grohe (1998), studies the effects of US economic performance on Canada. In this study she accounted for the scale of these economies. She notes that a shock, which directly affects the output of a large country, may also affect a small country, but the reverse is generally not the case. She uses this as an identification property and argues that the macroeconomic variables (output, employment, investment, exports, imports, and terms of trade) of Canada, a small country relative to the USA, respond to a positive shock in the US gross national product.

In this paper, the effects of the economic performance of the USA, Germany and harmonized data for industrial countries (Industrial Countries hereafter) are examined on the economic performance of Turkey. The connection between Turkey and each foreign country is represented in a block recursive VAR model as in Cushman and Zha (1997). The research cited above examines the relationships among developed countries and this paper differs from the literature in that, data from a small but developing country – Turkey – are used. To the best of the authors' knowledge, this is the first study that uses the data of a developing country and it is hoped that it will be a starting point for new discussion areas for other developing countries. Providing data from developing countries is important because there is not enough evidence from developing economies. While developed economies might be subject to similar shocks, it is unlikely that both developed and developing economies are subject to similar adverse shocks. Thus, providing evidence from developing economies is important.

As regards the outline of the paper; in the second section, the methodology is elaborated on, in the third and fourth sections, the specification of the model and the empirical evidence, respectively are presented. Finally, the last section concludes.

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¹ For a vast literature survey in this topic, see Backus *et al.* (1995).

II. METHODOLOGY

In order to make the assessment of an effect of a large economy's output on a small economy, the similar structural vector autoregressive (SVAR) model suggested by Cushman and Zha (1997) is basically followed. To be specific, a block recursive model is constructed where foreign economic performance is determined by its own dynamics (an AR process is used as a proxy) and Turkish macro-economic variables follow a 3-variable VAR model. Moreover, foreign output affects the Turkish economic performance as an exogenous variable. The difference between this system and a 4-variable VAR setup is such that none of the lag variables of Turkish economic variables enter the foreign country specification but lag value and instantaneous values of foreign income affect the Turkish economic performance.

The utilization of a VAR model, instead of the conventional single equation model, has some advantages. The VAR model captures dynamic relationships among variables of interest and has comparatively higher predictive power than single equation specifications. For this reason, a VAR model is used. If the standard form of VAR were to be used, there would be a serious problem in that the income of the foreign economy would be affected by the variables of the domestic one with their lags. In order to overcome this problem, an identified VAR model with block exogeneity was constructed. This block exogeneity also enables economically simultaneous interactions among variables to be specified.

III. MODEL SPECIFICATION

The general specification of the identified VAR model of Cushman and Zha (1997) is:

$$A(L)y(t) = \varepsilon(t) \quad (1)$$

in which, the $A(L)$ is an $m \times m$ matrix polynomial in the lag operator L , $y(t)$ is the $m \times 1$ observations vector, and $\varepsilon(t)$ is the $m \times 1$ vector of structural disturbances. Equation 2 shows the specification of the model.

$$y(t) = \begin{bmatrix} y_1(t) \\ y_2(t) \end{bmatrix} \quad A(L) = \begin{bmatrix} A_{11}(L) & 0 \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \quad \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{bmatrix} \quad (2)$$

In Equation 2, it is assumed that $\varepsilon(t)$ is uncorrelated with $y(t-s)$ for $s > 0$ and A_0 is non-singular. Moreover, the block exogeneity is represented by $A_{12}(L)$, which is zero. In other words, $y_1(t)$ is exogenous to the second block both contemporaneously and for lagged values.

The maximum likelihood estimation (MLE) and inference for the second block are computed with the conventional Choleski normalization with the modified error bands of Bernanke *et al.* (1996). This is because the MLE of the VAR model is not applicable to the identified VAR model with block exogeneity.²

The observation matrices are such that $y_1 = [\text{Foreign Income}]$, $y_2 = [\text{Domestic output, Inflation, Real exchange rate}]'$ and the lag order of the identified VAR model is 6. The order of the variables of the latter block is taken from Berument and Pasaogullari (2003), in which the model that Kamin and Rogers (2000) used for Mexico is applied to Turkey. All the variables in the system enter the specification in logs except the inflation rate.

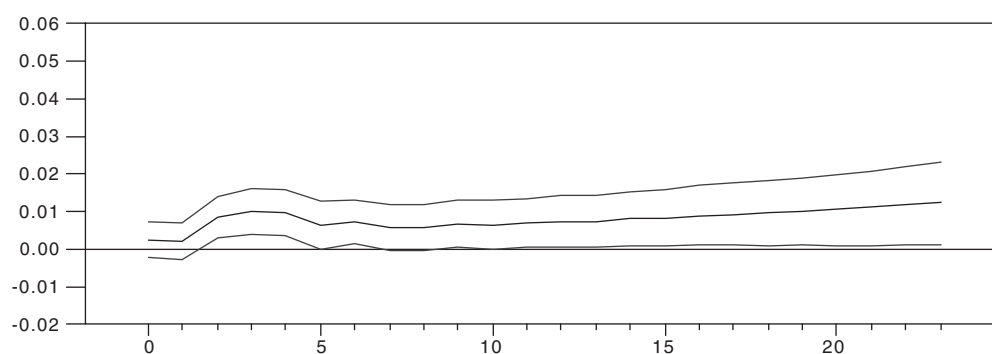
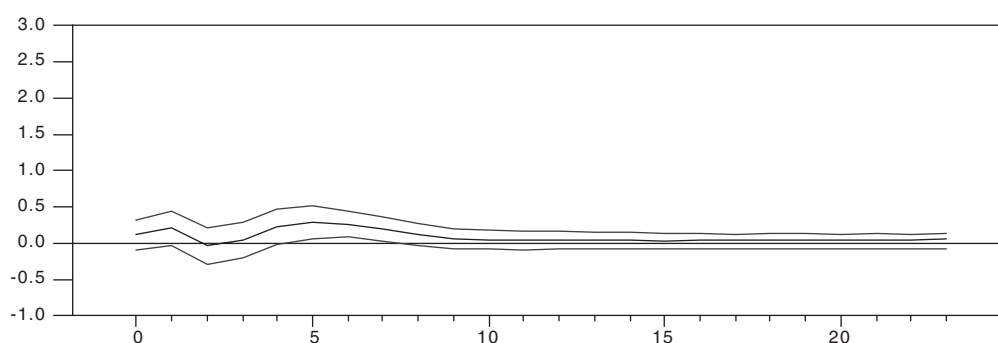
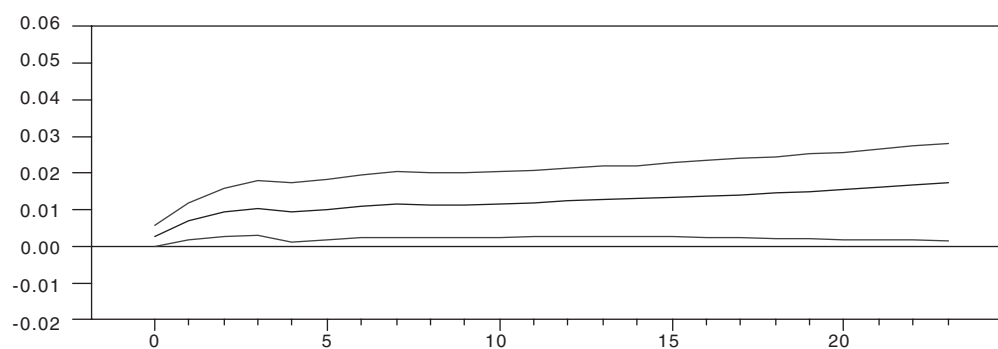
IV. EMPIRICAL EVIDENCE

The industrial production (seasonally adjusted) data for Germany, the USA, and Industrial Countries were compiled from the International Financial Statistics (IFS) of the International Monetary Fund (IMF); the industrial production, inflation rate, and the real exchange rate of Turkey were gathered from the Central Bank of the Republic of Turkey's data delivery system. The inflation is calculated as the first logarithmic difference of the wholesale price index.

In this section, the impulse response functions of the domestic economy to a positive shock in foreign income is discussed by using the data from 1986:05 to 2003:12 where the seasonality is accounted for by using monthly dummies. The same analysis is made for three different foreign income data: The USA, Germany, and Industrial Countries. The reason for choosing Germany was that it is the most important trade partner of Turkey. The USA and the Industrial Countries were chosen to demonstrate the responses of the Turkish economy to the rest of the world. The USA is also an important trade partner of Turkey. Following Sims and Zha (1999), the confidence intervals for the impulse response functions are constructed by using the Bayesian Simulation Method, where 2500 replicates were used for the simulations and confidence bands are reported at the 90% level.

Figure 1 reports the impulse response functions of domestic output, inflation and real exchange rate when one standard deviation shock is given to the US industrial production. The figure suggests that Turkish output responds positively to a positive shock in the foreign output. The evidence is statistically significant except for the first month. The response of inflation is introduced in the second diagram and it is positive for all the periods, but it is significant for the sixth and seventh months.

² See Sims (1986) and Gordon and Leeper (1994).

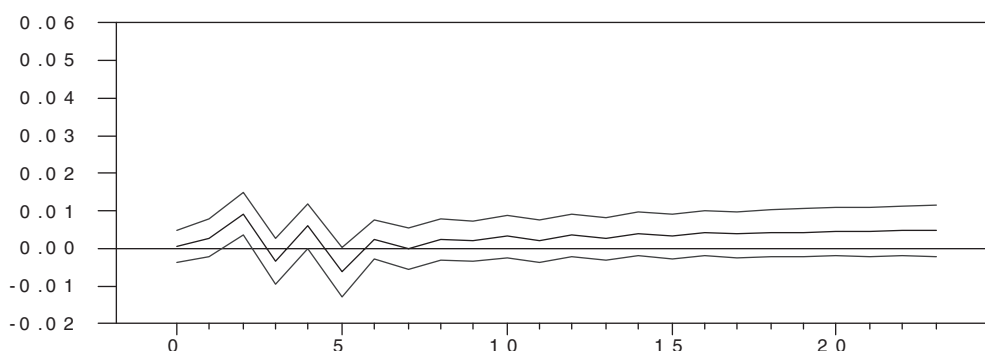
i. Response of *Turkish output* to *US industrial production*.ii. Response of *inflation* to *US industrial production*.iii. Response of *Real exchange rate* to *US industrial production*.Fig. 1. *Impulse responses of output, inflation and real exchange rate to a shock in US output*

According to the last of the three diagrams, in Fig. 1, the response of the real exchange rate is positive, which means that there is a real appreciation of domestic currency and the responses are statistically significant for all months.

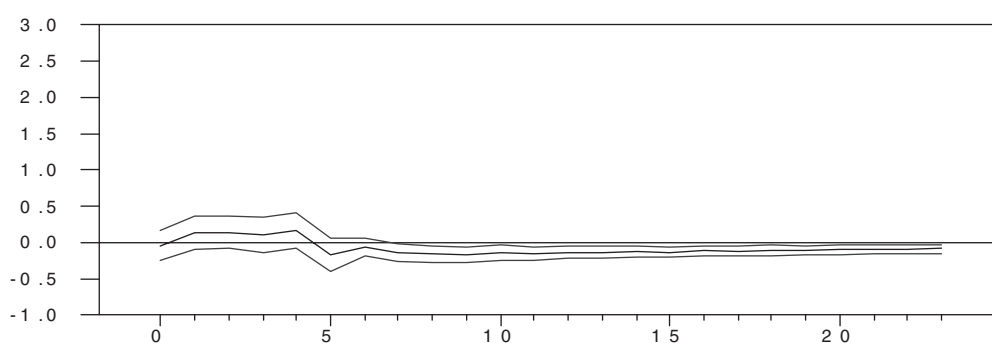
In Fig. 2, the same analysis is made as in Fig. 1, with the industrial production of Germany instead of that of the USA. According to the diagrams, a positive shock in the industrial production of Germany generally increases Turkish output. The peak point occurs in the second

month, which is also statistically significant. Moreover, another statistically significant effect is seen in the fourth month, which is also positive. The response of inflation is presented in the second diagram and it suggests that Turkish inflation increases for four months and decreases after that. However, the effect is statistically significant only after the seventh month. The real exchange rate responds positively to the shock contemporaneously, and then decreases. However, the effect on the real exchange rate is not statistically significant.

i. Response of *Turkish output to German industrial production.*



ii. Response of *inflation to German industrial production.*



iii. Response of *Real exchange rate to German industrial production.*

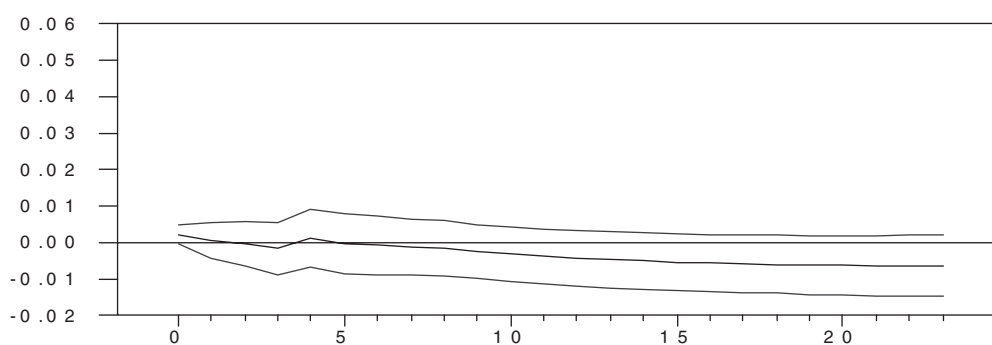


Fig. 2. *Impulse responses of output, inflation and real exchange rate to a shock in Germany industrial production*

Figure 3 reports the impulse responses of the same variables to a positive shock in the industrial production of Industrial Countries. The suggest that Turkish output positively responds to a shock in the industrial production of the Industrial Countries, where the responses are statistically significant for all periods except for the first month. Moreover, inflation responds positively, but is not statistically significant, and the real exchange rate responds with an appreciation as well as a statistically significant response for the first three months.

V. CONCLUSION

In this study, the effects of a foreign income shock of a large country on the domestic income of a small open economy are assessed by using a data set from Turkey, Germany, the USA and weighted average of industrial production of Industrial Countries. To the best of the authors' knowledge this is the first study that looks at the effect of a large economy's output on a small economy within a developing country framework.

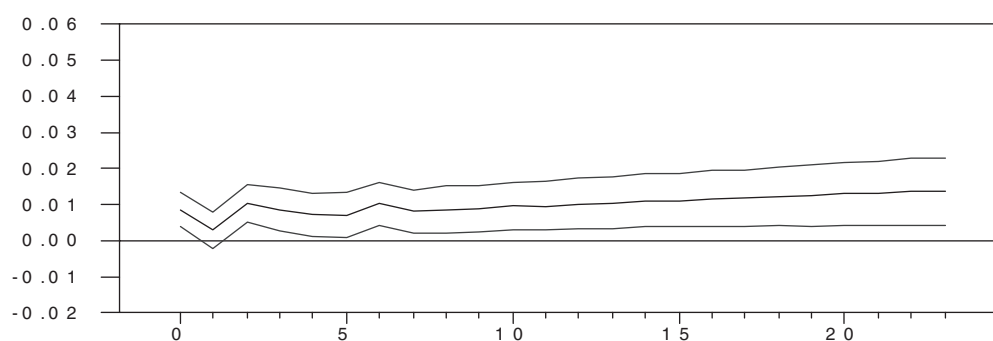
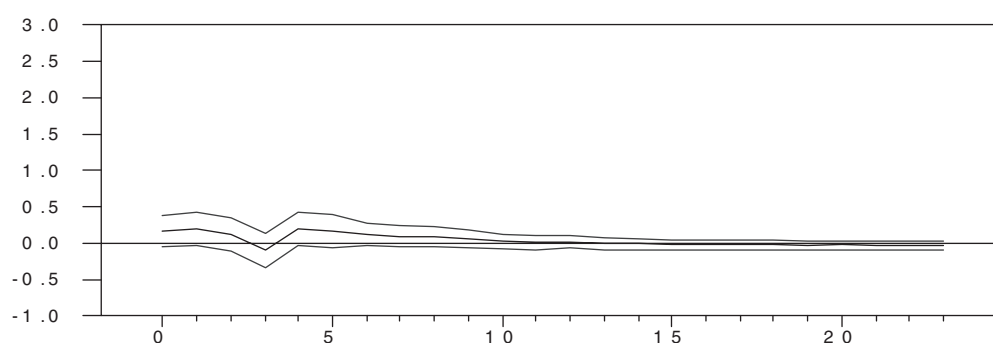
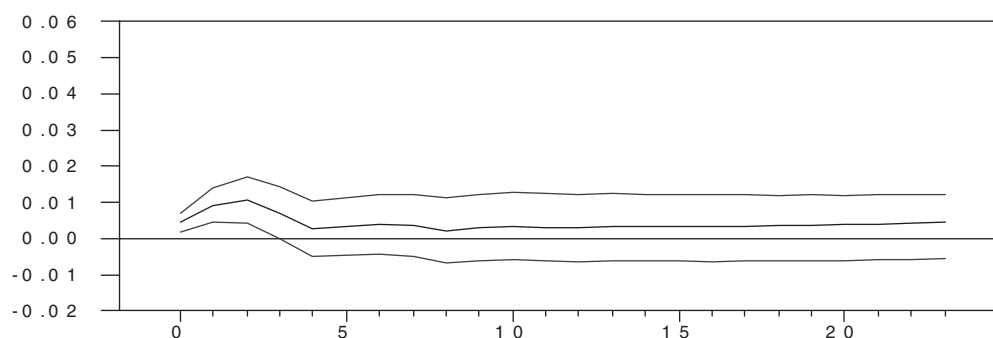
i. Response of *Turkish output* to *industrial production of industrial countries*.ii. Response of *inflation* to *industrial production of industrial countries*.iii. Response of *real exchange rate* to *industrial production of industrial countries*.

Fig. 3. Impulse responses of output, inflation and real exchange rate to a shock in the industrial production of industrial countries

The empirical evidence provided here suggests that a positive shock in the foreign income positively affects the domestic income. In other words, the domestic income responds positively to the shock. The real exchange rate responds to a similar shock with an appreciation and the inflation responds positively at first but negatively afterwards. These results are consistent with the findings of Schmitt-Grohe (1997), where she reports that a positive shock in the larger of a small-large country pair positively affects the economic performance of the smaller one.

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